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THE FOUNDRY TRADE JOURNAL IS THE OFFICIAL ORGAN OF THE INSTITUTION OF BRITISH FOUNDRYMEN AND THE WELSH ENGINEERS' AND FOUNDERS' ASSOCIATION

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The Foundry Exhibition.

Next Thursday will be a never-to-be-forgotten milestone in the history of British foundry practice, as it is on this day that the first exhibition ever held in this country, entirely devoted to foundry work, is to be opened. The present status of the industry, whilst better than ever before, is still low. It could be described as "scrappy," because there exist side by side in this country foundries which are second to none in all-round efficiency, and others which are almost past praying for, so antiquated are their methods of manufacture and organisation. It is to the latter variety that we make a special appeal to visit Birmingham, as nothing would keep away the representatives of the former. This exhibition is regarded by many as being the outstanding feature in the renaissance of British foundry industry. That progress has and is being made in the industry, which is worthy of the appellation renaissance, is indisputable, as is shown by the phenomenal progress made by the Institution of British Foundrymen. This has grown in a matter of 17 years from a membership of 38 to something approaching 2,000. Whilst this is still far from satisfactory, when looked at in the light of the number of foundries in the country, it is typical of the industry, which is still being retarded by a fair number of "stick-in-the-muds," who will have either to come into line or get out of business. In most branches of engineering the student looks forward to the day when he will be permitted, if he makes sufficient progress, to join the representative technical organisation of his industry, and the future will see similar conditions appertaining to the foundry.

Now a word to the exhibitors of foundry plant. If we are correct in our estimation that the foundry is to gain a better status in the engineering world, then as much help as possible is required from them, as they will play such a large part in its future development. It is a *sine quâ non* that in the rapid development of an industry the standard machinery of one year may become so improved as to render it obsolete in the course of a few years. It thus behoves every manufacturer to mark his models with the year. This effectually prevents silly comparisons. For example, there may be two equally well-known makers of moulding machines, the one we will call Brown and the other Jones. Assuming both these firms are progressive, then the comparison of one of Brown's latest models with a machine that Jones installed a decade ago is vastly unfair, and *vice versa*. We emphasise this, as we know of a case where an order was placed because the buyer had satisfied himself that one particular make of plant was superior to another, but had not realised that his confidential reports, on which he had placed so much reliance, constituted a comparison between the obsolete experimental model of the one firm and the latest design of the other. Thus it will be seen how necessary it is to date models of machinery, where progress is to be expected.

It is customary in most trades to hold exhibitions at regular intervals. It is highly probable that such conditions will obtain in our own in the future, and we suggest that, from every point of view, triennially would be adequate, if arrangements could be made with France and Belgium to follow suit in such a manner as to complete a cycle. This would allow of a more equal division of expense and enable European foundrymen to obtain an insight into each other's methods. At the moment there is nothing to prevent foundry exhibitions being held simultaneously in Birmingham, Paris, Liége and Munich, to the detriment of all. Only intense trade boom conditions could allow of firms with the most interesting exhibits showing in several places in one year, and it is more than possible British trade would suffer thereby.

MR. A. SIMPSON, civil and mining engineer, has died in his 91st year. Mr. Simpson, who was a director of the North British Railway Company, acted as engineer in many railway promotions and extensions all over Scotland and abroad. In his professional capacity he was identified with many leading industrial firms. He founded the firm of Simpson & Wilson, civil engineers, Glasgow, which is now conducted under the name of Simpson & Rankin.

XUM

Correspondence.

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

Cast Iron and its Chemical Composition.

To the Editor of THE FOUNDRY TRADE JOURNAL.

SIR,—Mr. Young, in his criticism of my paper, shows himself to be very human, in that he cannot retain either politeness or judgment when his prejudices are being disturbed.

He openly admits he is unable to dispute the contents of the paper; would he not have been wiser to have kept silent?

With regard to my alleged castigation of Professor Turner, Drs. Hatfield and Moldenke, may I ask the opinion of your readers? I am unable to accept Mr. Young's, for in one breath he condemns me for supplementing Dr. Moldenke's valuable researches and in the next openly condemns Dr. Moldenke himself, by stating in biting sarcasm that "although American practice involves the use of much machine-made pig-iron, few of us have noticed that the American casting is superior as compared with our own castings." Yet this is one of Dr. Moldenke's developments, and he claims much for this pig-iron. May I ask if Mr. Young is in a position to make this statement, and heed he include the whole of America in his condemnation? At least, I hope Mr. Young will not permit his prejudices to distort his sense of justice also.

Should any interested reader have any doubts upon the question of chilled cast pig-iron in the production of close-grained castings, I shall be glad to demonstrate its value to them, in any of our foundries or in their own.

With regard to the rest of my paper, this represents more than fifteen years of continuous research work in four different foundries. If I have not given sufficient science, it is because the paper was written for the use of foundrymen rather than chemists, and when Mr. Rang, secretary of the Newcastle Branch, requested a paper, he specially asked that it should treat practical problems and not include too much science. It was for this reason I chose the title "Cast Iron and its Chemical Composition," which gave me a free hand to touch upon a few of the numerous problems encountered in the manufacture of iron castings so far as cast iron and its chemical composition were concerned.

Now to deal with the rest of Mr. Young's comments:

(1) He sneers at the control of the chemical composition of cupola-melted cast iron. This I can understand after reading his paper published in December 22 and 29 issues of the JOURNAL; yet I may say my Company are prepared to supply iron castings to the guaranteed analysis, that is, within the following limits up or down:—Total C, 0.20; Si, 0.10; Mn, 0.10; S, 0.02; and P, 0.10 per cent.

I will gladly book an order for 100 tons from Mr. Young as a starting-point, not that I recommend such a control, but merely to demonstrate that it can and is being done.

(2) *Graphite in Pig-iron and Iron Castings.*—Mr. Young should consult the researches of Gonterman, Wüst and Peterson, Fletcher, Heyn and and Charpy, Adamson, Hatfield and Stead. They can answer this question better than I. May I, however, be privileged to correct his misrepresentation of my statement, which, if further abbreviation than that given in paper is required, should read: "Graphitic carbon in pig-iron possesses varying degrees of refractoriness, and exists in various forms determined by the method of manufacture, materials used, chemical composition, casting temperature and rate of cooling"? My contention is that the original graphite can and does exist in rapidly-melted grey pig-iron, which statement may be tested out by anyone interested. That both Si and P shift the position of the Fe-C (4.3 per cent. of C) eutectic, I think Mr. Young will agree with, and that both the temperature of heating in melting and the temperature of the metal in the ladle affect the quantity of free Gr. present in the molten metal before casting. Should he not accept this, as his statement in THE FOUNDRY TRADE JOURNAL, 1919, p. 159, which reads "*Cast iron commences to go solid when it has cooled to about* 1,130 *deg. C., and dropped into water at this point it will be white,*" leads me to think he might. I wonder if he has ever heard of or seen Gonterman's researches ("Journal Iron and Steel Institute," 1911)? He must admit that a large piece of sugar does not dissolve in a cup of tea as quickly as a small one, and that if the law of solution holds good for metals, then large flakes of graphite will not dissolve so quickly as the smaller ones, and that in rapidly-melted pig-iron coarsely disposed Gr. may not completely dissolve. Applying the laws of crystallisation, the pressure of this undissolved Gr. must tend to reproduce itself again in a finished casting, and the more slowly the casting cools the more perfect will be the reproduction of the original structure.

That this does occur, I have demonstrated over and over again in large-scale experiments. That the theory I offer is the correct one I do *not* claim. I merely offer it for what it is worth.

May I suggest to Mr. Young, in putting his problem to me, it might be as well to take temperature into account, and state from what temperature he wishes to run it into cold water? Then a reply might be possible.

In Mr. Young's fifth paragraph he again cuts a section out of my paper and misrepresents it. I state that 10 to 15 per cent. mild steel should effect a further grain-refining effect. This does not imply that I am a disciple of any correspondence course on semi-steel. I have never seen such books, nor do I know personally anyone who has, so that Mr. Young appears to have the advantage of me here, as I assume from the tone of his letter he has followed such a course and it has failed him. Mr. Young, however, should not condemn or even jibe at the use of steel in the cupola; there are always two sides to a question. Most foundrymen have proved its value. I ask Mr. Young to try again. He might have better success.

Temperature of Molten Iron in the Cupola and Casting Temperature.—The figures I have published on this question represent many months of laborious research. The temperatures quoted have been measured by means of Pt—Pt-Rh thermo-couples, and I vouch for their accuracy to + or − 2 per cent.

These pyrometers were calibrated to: (1) Silver, 961; (2) Cu under charcoal, 1,083 (3) Gold, 1,064; (4) Cu-Ni alloy, 1,200; and (5) Ni 1,451 deg. C. After calibrating, the couple was checked against the laboratory standard couple after each test, checked by means of a Wanner pyrometer under black-body conditions.

Mr. Gresty, Mr Young's assistant, writes suggesting the temperature of molten cast iron in the cupola is 2,200 deg. C. If this is Mr. Young's idea too, I suggest he investigate this complex problem, and he will find it a little more difficult than the writing of a criticism.

With reference to the main points brought up, may I here say that most of the experiments have been duplicated in foundries which have no connection? The chemical analyses have been performed with the greatest care, particularly the C.C. and Gr.C., being well aware of the difficulties confronting the chemist in this estimation. Mr. Young scathingly mentions combined carbon—would that I knew sufficient about this constituent as to dare to even pass any comment. Does Mr. Young know the effect of combined carbon on cast iron, and its relation to the physical properties of cast iron? It behaves quite differently in cast iron and in steel. He may dispute the point. If so, I ask him to cast two bars of an iron containing T.C., 3.0—3.3; Si, 2.0; Mn, 0.5—0.7; S, under 0.10 per cent.; and P, either high or low, from the same ladle, the one in dry sand, the other in chill; afterwards annealing the latter at 820 deg C., and then take tests. He will find the chill gives the higher tensile, transverse, and impact test, yet it will contain the lower combined-carbon content. I have gone rather deeper into my reply than I originally intended. May I say in conclusion that my methods, experiments, and records are accessible to any authorised body interested. I do not ask Mr. Young or anyone else to accept my statements, but to test them out for themselves. A work of this description is of little value if it will not stand this.—I am, Yours, etc.,

O. SMALLEY.

Messrs. Sir W. G. Armstrong, Whitworth,
& Company, Limited,
Close Works, Gateshead-on-Tyne.
May 30.

The Carbic System of Acetylene Generation.

In the ordinary way, calcium carbide, which is used so extensively in foundries and kindred works for the generation of acetylene for oxy-acetylene welding and cutting, perishes very rapidly in the presence of damp. Attempts have been made from time to time to overcome this difficulty by various processes of treatment and briquetting. Messrs. Carbic, Limited, of 51, Holborn Viaduct, London, E.C., can reasonably be said to have solved this problem by the introduction of carbic cakes and a simple apparatus which drives the water from the cake when operations cease, leaving the cake high and dry for when next wanted. Briefly stated, carbic cake is impervious

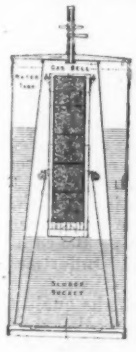

FIG. 1.—READY FOR USE.

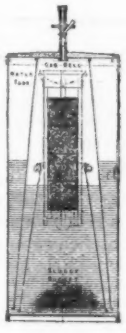

FIG. 2.—IN USE.

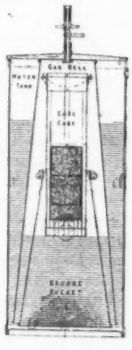

FIG. 3.—AFTER THE JOB IS FINISHED.

to atmospheric moisture, but readily reacts when placed in direct contact with it. Obviously, it makes the carbide much less dangerous to transport and handle.

When the acetylene is being generated from a cake immersed in a comparatively large volume of water, the temperature of generation is kept low which should make for even evolution and perhaps purity, the former is aided by the treatment which it has received.

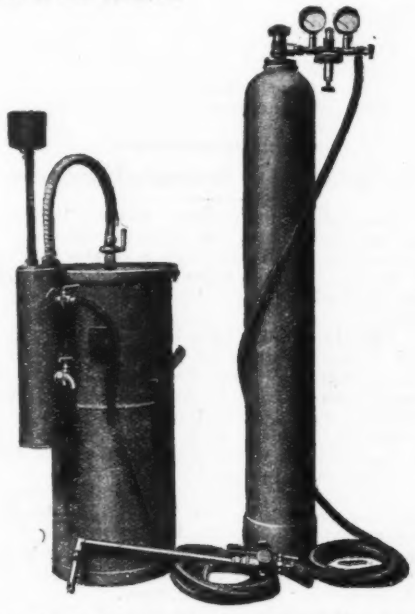

FIG. 4.—A PORTABLE CARBIC SYSTEM GENERATOR.

The Generator.

The carbic generator is shown in Figs. 1 to 3, which show the apparatus ready for starting in use, and at the end of the job. These figures clearly demonstrate that immediately the supply is cut off to the blowpipe, the gas drives the water from the remainder of the cake, which quickly dries up, no further generation taking place until it is again required for use. As each cake produces a definite quantity of acetylene, either by continuous or intermittent use, the apparatus can be charged with certainty to meet requirements.

The generator consists of four parts, the water tank, gas bell, sludge bucket, and cake holder. It is made both portable and fixed, the latter type usually being built up of several independent units. They are built up of sheet steel galvanised after manufacture. A portable plant is illustrated in Fig. 4.

The carbic system is being demonstrated at the International Foundry Trades' Exhibition to be held at Birmingham next week.

American v. British Grey [Cast Iron.*

By F. J. COOK, Rudge-Littley, Ltd., West Bromwich.

Beginning with the statement that the average British foundryman believes that American grey irons are inferior to those of similar class made in Great Britain, the author proceeds to explain that this belief is the outgrowth of accumulative evidence, some of which he presents in the paper. He speaks of castings on American machine tools, reputed in England to be so soft "as to be easily cut with a pocket knife." He also cites the case of an American machine tool in use in England during the war, of which "the only part remaining of the original cast-iron at the end of the war was the name plate on the bed." The author also refers to the frequent mention, in American technical journals, of failures of cast-iron fittings under superheated steam, bursting of cast-iron fly-wheels, etc. Such failures, he says, are infrequent in England. In testing American and British irons for comparison, one is faced by difficulties on account of differences in practice in the two countries. Americans place less dependence on tensile tests than their British cousins. The author's data show that seemingly representative British irons have a higher average tensile strength than American irons. American foundry literature, he says, conveys the impression that a tensile strength exceeding 31,360 lbs. is worthy of special notice. The average tensile strength of all bars tested by the author over a period of 500 consecutive working days was 36,288 lbs. No test was as low as 30,240 lbs. and the greatest strength was 43,008 lbs. The superiority of British irons is again claimed by reference to comparative tests on Keep's machine. Allowable percentages of chemical elements for various classes of grey iron differ in the two countries. The author believes American foundrymen pay too little attention to the total carbon content. Silicon receives a great amount of attention, and sulphur is taken much more seriously in the United States than in Great Britain. There also is an apparent difference of opinion as to the effect of phosphorous. The author believes the distribution of phosphorous, rather than the amount, is the important consideration. He also is of the opinion that the temperature at which pig-iron is made in the blast furnace has a direct effect upon the formation of a network structure of the grey iron—a formation which he describes and discusses in detail. Rotary fatigue tests and shock tests, used in Europe are described. In conclusion, the question is advanced as to whether the difference in strength of American and British irons may not be due to the slow running furnaces in Great Britain producing metal having better properties than that made by large, fast running furnaces "which appear to be general in America."

MR. M. R. LAWRENCE, president of the Institution of Production Engineers, who was formerly with the Lanchester Motor Company, Limited, Wolseley Motors, Limited, and Vickers, Limited, has been appointed manager of the Sterling Telephone Company's works at Dagenham, Essex.

THE IRONWORKERS in Leith shipyards, who have been on strike for some time over the question of the splitting up of riveting squads engaged in cutting out old rivets, have resumed work pending consideration of the matter in dispute.

* Abstract of a Paper read before the American Foundrymen's Association, Rochester Meeting.

XUM

Occurrence of Blue Constituent in High-strength Manganese Bronze.*

By E. H. DIX, JUN., Dayton, Ohio.

During an investigation on high-strength manganese bronze by the Engineering Division of the American Air Service, at McCook Feild, Dayton, Ohio, particles of a "blue constituent" were noted in the microstructure of most of the bronzes examined.

The constitution of the simple copper-zinc-base alloy is still a matter of dispute in spite of the fact that the copper-zinc series is one of the oldest industrially important groups of alloys, and has received the early consideration of scientific research. The diagram, according to the most recent work, is shown in the original Paper.

The disputed questions involve termination of the beta field and the line at 470 deg. C. The earliest experimenter, Roberts Austin, detected an arrest in some of his cooling curves at approximately this temperature and ascribed them to the formation of a eutectic; it has since been proved that there are no eutectics in this series. Shepheard was unable to detect any thermal arrests at this temperature; his diagram was essentially as shown, except that the line at 470 deg. C. was omitted and the beta phase carried down to normal temperatures. Later, Carpenter and Edwards, by a very painstaking research, definitely established the authenticity of the line, but attributed it to the breakdown of the beta constituent into a eutectoid of alpha and gamma. Microscopic evidence of the formation of the eutectoid is doubtful, and it seems more likely to be due to an allotropic change in the beta constituent. At least for practical purposes, it is more convenient to think of the structure of a 60-40 brass as a mixture of alpha and beta prime crystals rather than alpha plus an unresolvable eutectoid of "apparent beta" as it has often been called.

Manganese bronze consists of a 60-40 copper-zinc base alloy, to which is added small quantities of each of the elements, tin, aluminium, iron, and manganese. Usually the percentage of any one of the elements added is so small that, if added alone, it would be taken into solution, and the only effect on the structure would be to give more beta prime and less alpha than would be expected for the true zinc content. This effect can be satisfactorily estimated by the use of Guillet's "fictitious zinc" calculation. However, when even these small percentages of the four elements are added in the same alloy, the joint effect often produces small regular particles of a third constituent of a characteristic blue colour. That these particles are much harder than the alpha-beta prime matrix is shown by an examination of the polished surface unetched. They stand out in relief. Contrary to the findings of the experiments previously reviewed, in which the appearance of a special constituent was accompanied by a severe reduction in the elongation, a moderate amount of this constituent is found in ductile manganese bronze (having an elongation of at least 30 per cent.) and a considerable amount is usually present in particularly high-strength manganese bronze (over 35.7 tons per sq. in. tensile strength).

When the hardening elements (aluminium, tin, iron, and manganese) are added to the 60-40 copper-zinc alloy in sufficient quantities to produce a high-strength manganese bronze, a third constituent appears in the alpha-beta prime complex, which has a characteristic clear blue colour.

The occurrence of this constituent in reasonable amounts is not necessarily accompanied by brittleness.

Annealing for 7¾ hrs. at 845 deg. C., followed by either water-quenching or slow cooling, does not cause the disappearance of this constituent.

This constituent, when examined unetched, appears to be of a deeper blue than either the delta constituent of the copper-tin series or the gamma constituent of the copper-zinc series. When etched with NH_4OH plus H_2O_2, the blue constituent is unattacked except for a slight eating away at the edges under prolonged etching, whereas the gamma constituent with the same reagent is immediately tarnished and rapidly dissolved. The characteristic shape of the blue constituent is decidedly different from that of the delta of the copper-tin alloys.

For practical purposes in the study of the microstructure of manganese bronzes, it seems highly desirable to regard the blue constituent as distinct from either the delta or gamma, and it is suggested that it may reasonably be denoted as delta prime.

In the manufacture of manganese bronze, the particles of delta prime are precipitated from the copper-rich solid solution by the addition of the zinc. This precipitation is strongly influenced by the presence of iron, and, therefore, the particles probably consist of a solid solution of iron and copper with or without some tin, aluminium, or manganese.

* Abstract of a Paper read before the Spring Meeting of the American Institute of Mining and Metallurgical Engineers.

Brass Casting Research.

The British Non-Ferrous Metals Research Association, 71, Temple Row, Birmingham, has carried out an extensive research on the influence of gases on high-grade brass. A further investigation is now being started by the Association at the Research Department, Woolwich, in which the support of the Engineering Co-ordinating Board of the Department of Scientific and Industrial Research has been secured.

The advance which has been made in the quality of materials as a result of the increasing demands of the engineer is not always easy to appreciate even by those most closely connected with the industry. Well defined specifications and the provision of a greater variety of tests have certainly assisted in these improvements. Brass, both in its cast and worked forms, has shared in full measure in this progress, but the demand is ever for further improvements.

The prime object of the present work is to study the conditions necessary for securing both surface and internal soundness of strip brass ingots such as are required for cold rolled sheet metal. The investigation will throw much light on other types of casting in non-ferrous alloys and should interest a wide circle of manufacturers in the metal and engineering trades. Dr. Harold Moore, O.B.E., and Mr. R. Genders, B.Met., who have already been engaged successfully on similar work, will have charge of the research, which will be conducted partly in the works of members of the Association and partly in the Woolwich laboratories.

The Institution of Mechanical Engineers.

The Institution this year are visiting Paris and Liége, leaving London on June 12. The Société des Ingénieurs Civils de France have kindly placed their Meeting Hall and other rooms at the disposal of the Institution for the business portions of the Meeting.

The following Papers have been offered:—

Feed Water Heaters for Locomotives; by Professeur Edouard Sauvage, *Member*, of Paris.

Electric Locomotives; by Sir Vincent L. Raven, K.B.E., *Vice-President*, of Darlington.

Mechanical Vehicles and Road Surfaces; by Brig.-General Lord Montagu of Beaulieu, K.C.I.E., C.S.I., *Companion*, of London.

The Use of the Turbo-Compressor for attaining the greatest possible Speeds in Aviation; by Professeur Auguste Rateau, *Member*, of Paris.

The Supersaturated Condition as shown by Nozzle Flow; by Professor A. L. Mellanby, D.Sc., *Member*, and William Kerr, both of Glasgow.

Air-Compressors; by William Reavell, *Member of Council*, of Ipswich.

The Effect of Temperature on some of the Properties of Metals; by Professor F. C. Lea, O.B.E., D.Sc., *Member*, of Birmingham.

MESSRS. LIONEL ROBINSON & COMPANY, 3, Staple Inn, London, W.C.1, have been appointed selling agents for the Moler Fireproof Brick and Partition Company, Limited, for the handling of their refractory material which they are putting on the market under the trade name of "Radmolite."

Wolseley Motors, Limited.

This works is to be visited by the ladies attending the conference of the Institution of British Foundrymen to be held next week at Birmingham. The firm have just celebrated their "coming of age," and their story is in many ways synonymous with that of British motoring.

FIG. 1.—THE IRON FOUNDRY: MESSRS. WOLSELEY MOTORS, LIMITED.

The foundries have been specially laid out for the production of the various castings used for the manufacture of the highest-grade motor-cars, and much care is taken to see first that the patterns are carefully and well made, so as to give correct castings, which shall be exactly similar to the drawings of the design department, be so made that they will easily drop into the costly jigs which have been produced for manufacturing, and also that the material shall be to the specifications laid down after years of experience. They are entirely self-contained, and a department is incorporated for the manufacture and repair of moulding boxes and machining of pattern plates. The pattern shop is capable of making all the patterns, both in wood or metal, and keeps closely in touch

FIG. 2.—THE STEEL FOUNDRY: MESSRS. WOLSELEY MOTORS, LIMITED.

with the various foundries, so that the pattern plates, core boxes and moulding boxes are of the best obtainable, and kept in thorough repair.

Pattern Shop.

This is a large single-storey building under one roof, and has a large floor area. It is equipped with up-to-date machinery, both for working wood and metal, and also contains a small casting department, wherein repetition patterns can be made and finished quickly. Alongside the pattern shop is a large pattern stores, where in fire-proof storage bins, patterns are kept for replacing parts of motor-cars made by the company for the last 20 years.

The foundries are divided into four sections, of which illustrations are given in Figs. 1—4.

The Aluminium Foundry.

This has a considerable area, and is fully equipped with its own sand-mixing plant. The melting of the metal takes place in gas-fired tilting furnaces, and the teeming temperatures are closely watched by a chemist throughout the working hours. The core shop is fitted with various types of core-making machinery, and is so arranged that the work, as made at the various benches, is passed straight into the gas-heated core stoves, from which the dried cores are taken out at the other side directly into the foundry. Moulding

Fig. 3.—The Aluminium Foundry; Messrs. Wolseley Motors, Limited.

Fig. 4.—One of the Fettling Shops; Messrs. Wolseley Motors, Limited.

machines of the latest type are used on practically every standard component made, and wherever green sand cores are used in a mould, they are made on machines alongside the moulding machines. Many permanent moulds are used for simple components. Immediately the castings are made they are knocked out of the boxes, and the sand is re-mixed ready for further use. Electric riddles are used wherever possible.

Cast-Iron Foundry

This is a large well-lighted building of a great height, and having electric overhead travelling cranes and sand-mixing plant. It consists of two shops, in one of which the work is chiefly repetition, and dealt with by moulding machines. On the side of the foundry, as seen in our illustration, are two cupolas, each of 5 tons per hour capacity, one by Messrs. Alldays & Onions and the other by Messrs. Thwaites. A large charging stage is available, fed by an electric lift. It is interesting to note that the whole of the foundry coke is kept under cover. The returned metal from the foundries is carefully kept separate in the different specifications to which it has been made, and the chemist is constantly watching the charging operations, thus ensuring that the mixtures are being made strictly to specification. The core shop is an extension of the foundry on one side, and the cores are passed directly into coke-heated core stoves, and thence into the foundry to the moulders. An extension iron foundry is at the opposite side of the shop, capable of tackling the various odd castings which are required in a large engineering works of this description, and for the construction of semi-steel dies and die blocks for the various small and heavy presses used in the construction of motor-car bodies.

Steel Foundry.

The steel foundry is an extension of the iron foundry and is conveniently equipped for the rapid manufacture of light mild steel castings, both annealed and unannealed. The metal is supplied by two Stock oil-fired converters. The majority of the moulding is on jar-ram moulding machines, and the remainder is chiefly plate work on stripping machines. The core shop is at the end of the foundry, and the cores are passed directly into the producer gas-fired drying stoves, and thence to the moulding shop. Electric overhead cranes are available for the heavier classes of work.

Gun Metal Foundry.

This foundry, which is adjacent to the aluminium foundry, makes a large variety of mixtures, as desired for the various components of the Wolseley cars, including brass to two specifications, brazing metal, gun metal to three specifications, and phosphor bronze to two specifications. The melting of the metal takes place in two Mayer coal-fired furnaces. The work is chiefly very small, and a large amount of the various bush work is cast in chills, as also are many of the gear wheels.

Dressing Shops.

The dressing shops are two in number, one taking charge of the work from the aluminium and gun metal foundries and the other from the steel and cast-iron foundries. They are conveniently placed so that the work is continuously travelling in one direction, thus cutting down the handling charges and simplifying the handling of the large quantities of castings passing through the foundries. The former dressing shop is fitted with a large amount of sand-blast apparatus, metal saws, git cutters, and grinders, both for "bobbing" and surface grinding. Pneumatic chippers are used for the large fins on certain castings, but most of the work is so well jointed that there is very little dressing in the ordinary sense of the word. It is a standard operation to sand-blast at high-pressure every casting, as the Company desire to find a bad casting before it leaves the foundry rather than after it has had any machine labour spent on it.

The cast-iron and steel dressing shop is equipped with a most up-to-date shot-blast apparatus, both in cabinets, rotary table machine and shot-blast tumbling machines. Band saws are used for cutting off the steel castings and pneumatic chippers are used for both steel and iron castings and for the removal of cores. Castings are carefully "bobbed," and attention is given to the finish of the dressing. The shot-blast apparatus cleans away any scale, and particularly the sand from inside cores of all of the complicated castings made, thus ensuring that in the future life of a Wolseley car there is no trouble with sand in the interior of engines, gear boxes, axles, etc.

Die Casting.

Pressure die-casting is a regular operation in both aluminium and white metal alloys for small work, such as covers, brackets and bearings.

Inspection Department.

The inspection is most thoroughly carried out, and every casting is carefully examined, both for its soundness, freedom from cracks, blow holes, moulding or core defects, and also as to whether it will fit into the jig in which it will be machined. This latter is a point not always watched by many foundries.

Laboratories.

The whole of the supplies of material of all classes, including pig-iron, sand, core binders, fuel, etc., are carefully analysed and tabulated, and each consignment is kept separate, thus ensuring that the chemists shall be able to check carefully the mixings of metal in all the foundries. Test-bars are made from every cast of every metal, and both physical and chemical tests of these are taken and tabulated, and in case of rejection against specification, castings are held up often before reaching the dressing shop, and, in rare instances, scrapped for not being correctly made.

Raw Material.

The railway sidings are laid into the yard and foundries, and incoming material is weighed, stacked and marked for reference.

Measurement of Temperatures on Ladles for Iron and Steel Foundries.*

Notes on the breakage of suspensions of foundry ladles have been published from time to time. The author shows that while some investigators have attributed these failures to the design of the suspension, others, *e.g.*, Pomp, consider them to be due to a blue heat (200-300 deg. C.); but no conclusive data have been given as to the heats arising in works practice. Simultaneous experiments were therefore made by the author at Eberfeld, Mr. J. Treuheit at Malapane, and Mr. Mann at Ludwigshafen, under the conditions obtaining in iron foundries and small converter and Siemens-Martin plants. Measurements of temperatures were taken (1) in the suspension tackle, above and below the shackle in the middle of the crossbar, and at the ends of the crossbar; (2) at the trunnions of the ladle; (3) in the lathe bottom. When the crossbar was too slight to permit holes to be bored in it, similar scantlings of similar material with suitable holes for thermometers or thermo-couples were hung or attached in parallel.

The capacity of the ladles ranged from 1 to 12½ metric tons. Measurements were taken with mercury thermometers and with thermo-couples of platinum-platinum-rhodium and iron-constantan, and the instruments were carefully calibrated with each other, the thermo-couples being calibrated to cold-junction temperatures of 0 deg. C. and 30 deg. C.

Eight tables are given, for various sizes and contents of ladle and time effects in tests. The highest temperatures (280-320 deg. C.) always occurred on the exterior of the crossbar of the suspension near the shackle; the position of the suspension during filling had great influence (whether perpendicular or resting on the inlet to the pan or under it). From the results of the tests it is concluded that: (1) With suspension vertical above the ladle 200 deg. C. was never exceeded; (2) the internal temperatures in the hanger were lower than the external; (3) the temperatures near the shackle were always higher than at the ends of the crossbar or near the trunnions; (4) the temperature of the crossbar depended on the metal, the amount of slag over it, and the time occupied in filling and pouring the ladle; the latter exerted the strongest influence; (5) the trunnion and the bottom of the ladle heated inversely as the thickness of the lining; (6) when the suspension rested on the "run in," temperatures higher than 200 deg. C. and sometimes 300 deg. C. were reached.—L. TREUHEIT (*St. und Eis.* 41, 1526-1529; 1721-1726.)

* Institute of Chemical Engineers Abstract.

French Method of Moulding Tractor Wheels.*

The most common method of moulding these castings is to use a box divided into at least three segments. Between the two rows of spokes a fixed core is placed, and the outside chills are introduced from the top. The method outlined is stated to be quite new and to give good results. Fig. 1 shows the general layout of the mould, and Fig. 2 the pattern with the corresponding box; the division of the pattern into three segments, A, B, C, allows of their lateral withdrawal by means of two handles. The segments are fastened together by pegs, and joined together by means of clasps (*c*).

The moulds are made on an annular plate (*d*) (Fig. 1), bolted on to a cross-bar (*e*). This latter is bedded in such a manner that its upper surface (d^1) reaches the foundry floor level. The hub (*f*) of the cross bar (*e*) receives a pivot, not shown, which locates the hub core.

Before starting moulding the box (*g*) is threaded on to the pivot. It registers with the hub at its base, and receives the core (*k*). At the same time,

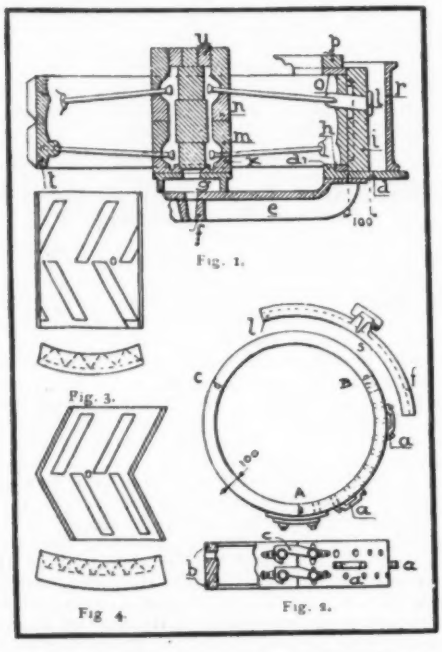

Fig. 1.

Fig. 3.

Fig 4.

Fig. 2.

it is possible to place around the interior box of the ring (*d*) a circle of flat cores (*h*), which register with the pattern (*i*), which goes on next.

The use of different widths of cores (*h*) allows of the production, with the same plant, wheels of various diameters. The sand is then rammed to the upper level of core (*k*), after which the first row of spokes can be laid in, the converging ends of which fit into holes provided for them in core (*k*), whilst the other ends fit into dowels formed by corresponding holes in the pattern.

In order to assure of a good hold the ends of spokes entering into the core are enlarged, as shown, and the other ends are flattened, which allows of their introduction into the dowel slits. The spokes being fitted, the next job is to thread cores (*m*) and (*n*) on the pivot, after which the sand is rammed up to the top surface of the upper row of spokes. These are now placed in position, followed by the core (*u*), when ramming is continued up to the top surface of the pattern.

By means of a template taken along the length of the edge of the pattern, a base is formed for a ring of flat segments (*o*), which are similar to the lower segments (*h*). Once in position, these segments are weighted down with a heavy iron ring (*p*). The dowels (*l*) are withdrawn from the mould, and then the three pieces of pattern by means of the handles (*a*). The chills, which are introduced laterally, can be divided obliquely, but not vertically, as used to be done.

After luting up the joints between the chills, a box (*r*) is placed around the job and the intervening space between it and the chills is filled with sand. The box is divided so as to lend itself to the expansion of the chills. If this is not done, the box would be likely to crack. The opening (Fig. 2) is maintained by a hinged clasp.

The teeming of the rim is effected, at roughly, point (*t*), just below the lower row of spokes, by means of channels. The hub is stripped 24 hours after the rim in order to eliminate contraction troubles.

* Translated from "La Fonderie Moderne."

Book Reviews.

FOUNDRYMAN'S HANDBOOK, published by The Penton Publishing Company, Penton Buildings, Cleveland, Ohio, U.S.A., obtainable from the London House, 2-3, Caxton House, Westminster, S.W.1, at 30s. net.

This book is compiled from the data sheets which appear in each issue of "The Foundry," but they have been revised to make them in accordance with modern practice. An adequate description of this work would be the "Foundrymen" Molesworth, as it contains all the data likely to be required by both pattern-maker and moulder.

Probably the section which will appeal most to the British foundry manager or foreman is that devoted to the computing of weights of castings. The non-ferrous side has not been neglected, for some 100 pages are devoted to useful notes as to the composition of the various alloys.

A section which should prove useful is that outlining the various specifications relating to foundry work. Whilst it should be remembered that these are American, it can safely be stated that in many cases they are likely to be adopted here.

Now that foundrymen are assuming an international outlook through their technical organisations, we would suggest that in future editions a table should be added for the conversion of kilos. per sq. mm. into tons and lbs. per sq. in. Foundrymen generally should welcome the chance to have so much useful data provided for them in a readily accessible form. The book is very well indexed.

"THE MARCONI DIRECTORY OF CABLE ADDRESSES," published by The Marconi International Code Company, Limited, Marconi House, Strand, London, W.C.2. Price 25s.

This is the first annual edition of the directory, and embodies many new features, and is arranged throughout for quick reference to any item. The alphabetical section which gives the full titles, description of business, full postal and cable addresses of the leading business houses of the world. It is arranged in one complete series, instead of providing separate lists for each country or state. Similarly, the buyers' and exporters' guide shows under each trade heading the principal firms in each country engaged in that particular trade, and at one opening you are able to select firms in any part of the world. The time-saving advantages afforded by this unique arrangement are obvious.

Another unique feature is provided by the indexes to the buyers' and exporters' guide, which have been translated into five different languages, thus enabling subscribers of almost any nationality to use the section.

Not the least important section, however, is the cable address register which enables you to identify the sender of a cablegram when an unfamiliar signature has been used. The information contained in this section eliminates entirely the necessity of searching your own letter files, etc., and avoids the expense of despatching a cabled inquiry for the sender's name when your own efforts to trace him have failed.

The volume is certainly well worth the price charged, and readers whose business calls for the despatch and receipt of cables, or who buy or sell in foreign and colonial markets, would be well advised to take an early opportunity to examine it.

THE imports of foreign ore at the Workington dock last week amounted to 2,620 tons. During the week 1,861 tons of rails and 614 tons of spiegel were shipped to foreign ports. At Whitehaven last week 1,100 tons of pig-iron were shipped to Antwerp and Ghent.

The Manufacture of Coke for Industrial Purposes.*

By A. D. Young, Engineering Assistant, Burnley Corporation Gas Department.

It may be truly said that the prosperities of the mining, coking and iron industries are interdependent, and before considering the question of coke manufacture, it should be pointed out that the requirements of the iron industries with regard to the physical properties of fuel are :—(1) A well-developed cell structure; (2) hardness; (3) suitable size; (4) non-friability; and for the chemical properties: (1) large fixed carbon content; (2) low ash content; (3) low sulphur and phosphorus content; (4) low water content.

Physical Properties.

The practical success of blast furnace and cupola working is chiefly dependent on the mechanical condition of the coke used. The most dense coke produced by coke ovens has not been found too dense or too hard for blast purposes. A soft coke is found to be very soluble in the carbonic acid in the upper part of the furnace, and a fuel which changes shape either through being crushed by the weight of the accompanying materials, or breaks down into a large proportion of small in carriage or handling, will not give such good results in furnace work, due to the larger surface exposed to the action of carbonic acid, and the small coke filling the interstices between the material, and reducing the working capacity of the furnace. As the gases will not ascend regularly and evenly throughout the mass in the blast furnace, due to being checked by the small coke filling, and escape without being fully oxidised to carbonic acid, it results in a higher fuel consumption, due to the heat lost.

A fuel which softens under the action of heat is, of course, undesirable, as the filling of the interstices of the charge with pasty material impedes the current of gases and hinders combustion.

The ideal coke structure would be one which would descend through the furnace shaft to the combustion zone with the least loss from attrition and oxidation, and burn at the highest possible rate on arriving there. Walther Mathesius, in a paper on "Chemical Re-actions of Iron Smelting," states that this is accomplished by producing a coke with an open-cell structure, in which the cell walls themselves are amply strong, and well protected by a graphitic coating.

Generally it may be said that to produce the best furnace coke, open-cell structure with hard, strong cell walls is required. This does not necessarily mean that the coke should have a high percentage of cell space.

The advantage of an open-cell structure is that it gives the oxygen of the air free access to the carbon. The composition of the cell wall should be hard, thin and strong. Assuming a coke of a fine cell structure, having, say, 50 per cent. of cell space, it is possible that such coke might offer less surface for combustion than another coke having the same percentage cell space, but containing larger cells. It is probable that the coal mixture, degree of fineness of original coal, length of coking time, carbonisation, temperature, and the amounts of volatile matter and water in the coal, affect the question of cell structure and hardness.

Steel smelters using crucibles prefer a coke made in the beehive type of oven, as the coke is in long needles and more suitable for packing round the crucibles than by-product oven coke, which is more in the shape of long and wide blocks. This preference may to some extent be due to prejudice, but it must be admitted that the beehive coke is sometimes of better quality than the recovery oven coke, when such can be obtained containing not more than 4 to 5 per cent. of ash, and 0.8 per cent. of sulphur. It must be recognised that they require a coke of low ash and sulphur content, with ash that will not fuse at the ordinary working temperature of the furnace, as fusing leads to the breakage of the expensive pots, and the materials handled are very valuable. Again, the texture of recovery oven coke is too dense for crucible steel melting, and a coke of the character of beehive coke (more open and porous) gives better results, but recovery oven coke of suitable structure can be used quite successfully if the percentage of ash and sulphur are not too great.

Chemical Properties.

A low ash content is desirable in all coke for whatever purpose it may be used, as ash reduces the calorific value of the fuel per pound, and is simply so much inert material put into the furnace for no purpose, and, neglecting any damage it may do to furnace linings through fusion, requires an extra consumption of coke to heat it up to the working temperature of the furnace. It, of course, also increases the amount of slag to be dealt with, and may also increase the impurities in the metal being melted due to its silica content.

The whole of the ash in the coal remains in the coke. The sulphur in the coal can be regarded as ultimately dividing itself into two parts. The fixed sulphur, which remains in the coke and which is about 80 per cent. of the total sulphur in the coal, and the free sulphur which is evolved as sulphuretted hydrogen, etc., and passes off with the gas.

The whole of the phosphorus in the coal also remains in ash, so that the quantity is not reduced during the coking period.

In general it may be said that the ash content of the coke should be less than 10 per cent., sulphur 1 to 1.25 per cent., and phosphorus 0.02 per cent., the original coal being treated suitably to attain this result.

Another impurity in coke generally of importance to maltsters using coke (usually of gas-works production) is the amount of arsenic present, which on roasting the malt may be carried forward into the beer.

The Preparation of Coal for Coking.

Only certain classes of coal will give a satisfactory coke, and the real cause of coking is not well understood in spite of all the research work. The general conclusion is that coking is due to certain resinous constituents of coal, which on being heated act as a binding agent, and form the particles of carbon in the coherent mass termed coke. These constituents vary in amount in different coals, and the coking power varies accordingly. One of the earliest and best classifications of coal is by Gruner, which is shown in Table I.

TABLE I.—*Gruner's Classification of Coke.*

	Per cent. of coke to pure coal.	Composition of coal, per cent.			Nature and appearance of coke.
		Carbon.	Hydrogen.	Oxygen.	
1.—Dry coal (long flame)	55 to 66	75 to 80	4.5 to 5.5	15.0 to19.5	Powdery or slightly coked.
2.—Fat gas coal (long flame)	60 to 68	80 to 85	5.0 to 5.8	10.0 to 14.2	Completely agglomerated, oftener caked, very porous.
3.—Semi-fat or furnace coal	68 to 74	84 to 89	5.0 to 5.5	5.5 to 11.0	Caked and more or less puffy.
4.—Coking coal (short flame)	74 to 82	89 to 91	4.5 to 5.5	5.5 to 6.5	Coked, compact.
5.—Lean coal and anthracite.. ..	82 to 90	90 to 93	4.0 to 4.5	3.0 to 5.5	Slightly coked, oftener powdery.

It must be understood that such classification is only general, as there are several exceptions.

From Table II., published by the late G. S. Cooper, it will be seen that the percentages of H_2O, CO_2 and CO are a fair guide to the coking properties of a coal, these percentages being proportional to the original oxygen content of the coal.

The general conclusion is that if the oxygen content reckoned on the dry ash-free coal exceeds 8 per cent., the coke is of a very inferior character,

* A Paper read before the Lancashire Branch of the Institution of British Foundrymen.

and the coal is non-coking. Mr. Cooper also pointed out that if the yield of water from the dry coal on distillation is more than 7 or 8 per cent. the coke is of an inferior character.

Up to about thirty or forty years ago, when coal was much cheaper, it was the custom for the inferior coal to be left below ground, and the beehive coke ovens of the day only dealt with coal of the best quality, and, in consequence, provided a high quality coke.

Economic conditions since that time have changed very considerably the value of this inferior material, which for some years past has been brought to the surface, and can now be converted

Table II.—*The late Mr. G. S. Cooper's Classification of Coals.*

	Coke, C. %	Water, H_2O %	Carbon di. oxide, CO_2 %	Carbon mon. oxide, CO %	Character/of coke.
Cumberland ..	69.8	5.34	0.94	6.0	Good.
Durham	76.5	4.11	1.02	4.6	,,
Warwick	62.0	12.98	3.6	10.6	Poor.
Monmouth ..	80.0	3.37	0.51	3.2	Good.
Staffs.	71.0	7.53	1.08	4.9	,,
Yorkshire ..	70.0	6.66	1.28	7.8	,,
Lancashire ..	70.0	6.80	1.48	5.2	,,
Lanark	65.0	8.09	2.45	10.7	Fair.
Fife	68.0	9.12	1.99	7.6	Good.
Northumberland	67.0	8.55	2.46	7.8	Fair.
Forest of Dean ..	86.0	6.73	1.58	7.5	,,
Leicester	63.0	10.52	2.74	12.4	Poor.
Lancashire Cannel	63.0	6.19	0.56	5.6	,,

into a good class coke after suitable treatment by washing. Practically the whole of the coke now used for coking is the poor quality slacks which may have an ash content of from 10 to 30 per cent. This ash content must be reduced to 7 per cent., or preferably less, before the coal is suitable for coking. The ash arises from stone, slate, shale, etc., in the dirt partings, and from dirt in combination with the coal, whilst the sulphur is in the form of iron pyrites, and mineral sulphated existing in combination with the coal.

The specific gravity of coal ranges between 1.2 and 1.35, and that of the impurities is greater; therefore, if the coal be put into water the impurities will sink more rapidly than the coal, and eventually there will be two layers of material, the lower being impurities and dirt, the upper being pure coal.

For the washing the coal is fed into moving water; the dirt rapidly sinks and the coal is carried away by the water, resulting in separation of the coal and dirt. Some coal may sink with the dirt, and some dirt may be carried along with the coal, but by regulations of the coal feed and the water feed, and other variables on the plant, these quantities can be reduced to a minimum, and, if necessary, the products washed again.

The figures in Table III. are taken from a test by Mr. J. W. Lee, of Chesterfield.

Table III.—*Showing Dirt Reduction After Washing.*

	After screening (½ in.) but before washing. per cent.	After washing. per cent.	After dirt rewasher. per cent.
Ash	26.56	8.87	3.75
Volatile matter	22.94	30.98	32.40
Sulphur	2.98	2.38	2.11
Dirt in coal sinking at 1.45 Sp.Gr.	32,82	8.45	3.56
Coal in dirt sinking at 1.45 S. Gr.	—	8.83	3.15

After washing the coal must be allowed to drain for about twenty-four hours before being sent to the coking plant, to reduce the water content to about 8 to 10 per cent. at the time of charging oven, and the coal must also be crushed to a fine state of division before charged into the oven. Practically all the coke used in this country for fuel purposes may be said to be produced by one of two main processes:—(1) Carbonisation in bulk in coke ovens, which may be sub-divided into (*a*) beehive-type charge about 6 tons, the carbonising period about 70 hours, and (*b*) the recovery oven charge of about 8 to 12 tons, the carbonising period in this case being from 18 to 24 hours. (2) Carbonisation at gas works, which again admits of two sub-divisions: (*a*) In horizontal retorts containing a charge of from 5 to 15 cwts. of coal, the carbonisation period being 5 to 12 hours, and (*b*) in vertical retorts, the carbonisation being continuous.

Carbonisation in Coke Ovens.

The early type of coke ovens were called beehive ovens on account of their domed tops, and were about 12 ft. wide × 10 ft. deep, the ovens being built in groups to retain heat and minimise brickwork. They were fitted with a hole in the top of the dome about 2 ft. 6 in. diameter (which could be closed by a plate), used for the charging the coal into the oven, and an opening in the front for withdrawing the coke, this being bricked up during the period of coke manufacture. Others were fitted with a sliding door in an iron frame, the door being provided with adjustable air inlets. The charge could be introduced either through the hole at the top or by the door, but it was found that the coke was of more density if the coal was charged by the door than was the case when it was shot in from the top, due to a dense mass of small coal being formed under the hole which carbonised more slowly than the rest, and so gave a less uniform quality of coke. In this form of oven, the new charge of coal when introduced, fired from the bottom of the structure, remained sufficiently hot from the last charge; but when the gas began to be evolved it burnt above the charge of coal, and the heat spread downwards through the mass continuing the carbonisation, the completion of the coking period taking 70 to 84 hours per charge of 7 tons. At the end of this period the ovens were allowed to cool down for about 12 hours, and the coke drawn by rakes and quenched with water. It will thus be seen that these ovens were heated entirely by the combustion of the vapours and gases evolved during the carbonisation of the coal, together with a small proportion of the coal within the oven, no external heat being employed.

Modifications of this type of oven have been built, in which they are built back to back with a flue between them, the pull of the chimney drawing the products of combustion, and the incompletely burnt gases through the furnace space of a Lancashire boiler, and utilising the heat for steam-raising which would otherwise go to waste.

Thus in all forms of beehive ovens, air is admitted to the carbonising mass, and it is clear that a certain proportion of the carbon in the heated residue, as well as the gases, must be burned, and the coke thus burned is rarely more than about 6 per cent. of the coal carbonised.

The beehive oven serves so well for certain types of coal, difficult to deal with in the chamber types of oven, that it has retained its place down to the present day, but from time to time attempts have been made to so arrange its construction as to recover some of the valuable by-products which were being wasted.

Most builders of recovery ovens also build non-recovery ovens of the chamber type with a coking chamber about 33 ft. long, 6 to 8 ft. high, by about 18 in. wide, for coking coals in cases where the amount of by-products from the coal is insufficient to warrant the installation of recovery plant. These ovens are heated by burning the evolved gas by flues at the sides and under the bottom of the oven, and are worked in pairs, one oven being recharged with fresh coal, when the other oven charge is half-coked. These ovens give a larger yield of coke per ton of coal than beehive ovens.

Externally-fired ovens to which no air is admitted, and the heat for carbonising obtained from the combustion of the gas.—The development of this class of oven has been continuing for nearly half a century, and although the bulk of metallurgical coke made in some countries (such as Great Britain and U.S.A.) is still produced by the old beehive ovens, the advantages of the modern retort coke oven working in conjunction with a by-product recovery plant are becoming more appreciated, and during the last few years many large new coking plants have been erected, the reasons being:—(1) The demand for a denser and harder coke for blast-furnace work; (2) the amount of coke per ton of slack carbonised is increased by about 10 per cent.; (3) the by-products (*i.e.*, ammonia, tar and benzol) are recovered, which in normal times means a gain of some few shillings per ton of coke produced; (4) reduction of labour charges per ton of coke produced; (5) after allowing for heating the ovens, 5,000 cub. ft. of gas

are produced per ton of coal carbonised, of a quality suitable for town lighting, engine driving, or any industrial purpose; (6) the throughput of coal per oven is much greater in a given time.

By-Product Ovens.

It must also be realised that Germany some years ago abolished the beehive oven, and reorganised her iron industries so as to use only by-product oven coke.

The requirements of a good modern coke oven are :—(1) That it shall be of strong and simple constructure, and easy to repair; (2) the regulation of the heat must be easy, with a minimum of labour; (3) easy inspection of all parts of the oven; (4) uniform temperature throughout the heating flues and coking chamber; (5) maximum yield in coke and by-products, with a minimum coking time; (6) minimum of wear and tear, with facilities of making repairs. This type of oven may be divided into two classes, known as (*a*) the regenerative oven, and (*b*) the waste-heat oven, and these may be provided with either horizontal or vertical flues, vertical flues predominating.

The ovens are arranged in batches, and built side by side, and are separated by hollow walls which form the heating flues.

The oven length may be 33 ft. or over, the height 7 to 10 ft., and the width about 18 in. to 20 in., depending on the size and type, and are built ½ in. wider at the discharge side to facilitate the pushing out of the coke at the end of the carbonisation period. Coal is charged into the ovens either at the front end (charger side) by a travelling machine, which places a cake of coal into the oven, or by a charging hopper which travels on the top of the oven and drops the coal through three or four shoots formed in the top brickwork.

The coal will fall into a series of peaks in the oven, and these are levelled down by a mechanical levelling machine, which travels on rails at the front of the oven.

Strong iron doors lined with firebrick are provided at the oven ends, and are fitted with lifting gear for raising and lowering when charging operations are taking place. On the top of the oven a stand pipe is attached for the withdrawal of the gases given off by the coal during distillation. These gases are taken away and suitably dealt with for the recovery of by-products, returned again to the ovens after stripping, and burnt in the heating flues, thus providing the necessary heat to carbonise the coal. These gases, after burning in the oven flues, are disposed of in different ways, to recover the sensible heat in them according to the design.

Waste Heat Oven.

The spent flue-gases are led away from the ovens and passed through the furnace tubes of Lancashire boilers for the production of steam, the amount of steam obtained being about 1 ton for every ton of coal carbonised which is used on the by-product plant.

Regenerative Oven.

The spent gases are passed into regenerators filled with chequer brickwork under the ovens, the sensible heat from the gases being absorbed by the brickwork. After the brickwork has become sufficiently hot the waste gases are switched over to another regenerator, and the air necessary for combustion of the gas in the heating flues is passed through the hot regenerator on its way to the combustion chambers above the gas burners.

It will be seen from the above that in the case of the waste heat oven only gas is supplied for oven heating, and cold air is drawn in to complete the combustion, the burnt gases being dealt with as explained previously. Under operating conditions to-day where benzol is recovered from the gases given off in the distillation of the coal, there is only about sufficient gas for heating the ovens after it has been stripped of other by-products.

In the case of regenerator ovens no waste heat is available for steam raising, but there is about 5,000 cub. ft. of waste gas per ton of coal carbonised over and above that necessary for heating the ovens. This gas, which has a calorific value of about 450 to 500 B.T.U. per cub. ft., and an illuminating power of nine candles, may be used for power purposes, steam raising, industrial heating, or, after suitable treatment, for domestic purposes, and town lighting.

Stamping, Charging and Discharging Machines.

It is often found necessary to compress the charge of coal before charging the same into the oven, as in the case of coal mixtures, from strongly coking, and only moderately coking coal seams, such coal being thoroughly mixed in the disintegrator. The compression gives a denser coke, and in many cases enables the oven to turn out a satisfactory coke from slacks, which were entirely useless for the manufacture of beehive coke.

The stamping machine may consist of a steel box corresponding in size to the oven, travelling on rails along the oven front. The disintegrated coal is compressed by means of a magnetic or mechanical stamper, layer by layer, to the shape of the box, and then is introduced into the oven as a solid cake.

The coke is discharged from the oven by means of a mechanical ram which pushes the charge of coke out of the oven at the discharged side, where it is either quenched on the coke bench and handled mechanically by a coke-car before dispatch, or is received from the oven into a quenching, screening, or loading machine.

It will be seen that the coke-handling machinery must be of such a type as to break up the coke as little as possible, and the coke-car method shows an advantage in this respect over the mechanical quencher, and loading machine, but the water content of the coke is not so constant throughout the mass due to being quenched on the bench. The quencher machine gives coke of a better appearance, due to coke being quenched out of contact with the air, resulting in a good silver-grey appearance.

Other factors which affect the physical condition of the coke (besides the coking qualities of the coal) are moisture, carbonising temperature, and length of carbonising period.

The heat passes slowly from the walls into the charge at each side, the heat travelling towards the centre. This results in the coal, in immediate contact with the walls, being carbonised some hours before the interior of the charge. The centre portion of the charge does not reach a temperature of more than 200 to 300 deg. until about halfway through the carbonising period, depending to some extent on the moisture content of the coal. The interior portions of the charge are thus distilled at a low temperature during a portion of the time, and at the higher temperature which follows later, the volatilised products passing through the coke mass are partially broken up, and carbon is deposited in the spongy mass of coke. This deposited carbon is largely responsible for the hardness and the colour of the coke, which is carefully watched on quenching.

It is well known that too high a temperature or over-coking produces a harder coke, but smaller in size and more brittle.

Another point affecting the size of the coke is the distribution of the ash throughout the coke substance.

THE NORTH LINCOLNSHIRE IRON COMPANY, LIMITED, of Scunthorpe, Lincolnshire, have transferred their registered offices to Broad Street Chambers, Birmingham. In future all communications relating to accounts, pig-iron sales, delivery instructions, coke purchases, and all secretarial and head office matters should be addressed to Birmingham, and not to the works. Mr. Hilton, 52, Camp Street, Broughton, Manchester, will continue to represent the company in Manchester as pig-iron sales agent.

SIMPLEX CONDUITS, LIMITED, Garrison Lane, Birmingham, are issuing a card urging the recognition of the value of distinctive marks on manufacturers' products. The largest electrical concerns in the country have associated themselves with this scheme emphasising the importance of specification. The distinctive mark for the identification of Simplex products has been issued largely as the result of numerous instances coming to light where electrical conduit, other than that manufactured by the company, has been supplied against specific requisitions for Simplex conduit. As a safeguard, every length of Simplex conduit now bears a reproduction, in transfer form, of the company's trade mark.

XUM

Thermal Expansion of Nickel, Monel Metal, &c.*

BY WILMER H. SOUDER AND PETER HIDNERT.

The increasing use of commercial nickel in spark plugs, of monel metal for high-pressure steam valves, stems, seats, etc., of stellite for surgical and household uses, of stainless steel for numerous purposes such as aeroplane- and automobile-engine valves, pump rods and marine fittings, and of aluminium, or its alloys, almost universally where lightness is necessary, has created a demand for data on the thermal expansion of these materials.

This Paper includes original data on the thermal expansion of ten samples of commercial nickel, ten samples of monel metal, five samples of stellite, two samples of stainless steel, and two samples of exceptionally pure aluminium, in addition to the results obtained by previous observers on the expansion of nickel and aluminium. All these materials, except stainless steel, were examined from room temperature to about 600 deg. The samples of stainless steel were heated from room temperature to 900 deg. C.

Commercial Nickel (10 samples, 94 to 99 per cent. Ni).—Five samples were hot-rolled, and the remaining five samples of corresponding compositions were hot-rolled and annealed. In most of the expansion curves of these samples of commercial nickel a slight irregularity was perceptible in the region near 350 deg. C., but there was no marked change or anomalous expansion such as was observed by the previous investigators in the case of pure nickel. Annealing of the hot-rolled samples of nickel usually caused a slight increase in the values of the coefficients of expansion.

Monel Metal (10 samples, 60 to 69 per cent. Ni).—Two samples were cast, and three were hot-rolled. The remaining five specimens of corresponding compositions and treatments received additional heat treatment—that is, they were annealed. The expansion curves of monel metal were found to be fairly regular. The average coefficients of expansion of the various samples for the range from 25 deg. to 300 deg. C. are all practically equal. For the temperature range from 25 deg. to 600 deg. C. the average coefficients of the cast samples are greater than those of the hot-rolled alloys.

Stellite (5 samples of various grades).—The expansion curves show irregularities in the region between 300 deg. and 500 deg. C. The stellite containing 10 per cent. tungsten has the smallest coefficients of expansion of all the samples investigated. The hammered stellite has smaller coefficients than the unhammered sample of corresponding composition, which indicates that hammering may lower the value of the coefficients of expansion.

Stainless Steel (2 samples).—The expansion curves, including the critical regions of an annealed and a hardened sample of stainless steel, were determined. On heating, both samples indicated critical regions which extended from approximately 825 deg. to approximately 855 deg. C. The transformation point on cooling occurred at approximately 800 deg. C. Up to the transformation regions the heating and cooling curves of the annealed samples are fairly regular. In the case of the hardened stainless steel the curve is irregular between 200 deg. and 400 deg. C., where the strains produced in hardening were released. Above 400 deg. this sample behaved like the annealed specimen. The coefficients of expansion of these stainless steels are less than the coefficients of ordinary iron or steel.

Aluminium (2 samples, 99.74 per cent.).—The thermal expansion of the two samples of cast aluminium investigated between room temperature and 600 deg. C. may be represented by the following empirical equation:—

$$L^t = L^\circ [1 + (21.90\, t + 0.0120\, t^2)\, 10^{-6}]$$

SANDERSON BROTHERS & NEWBOULD, LIMITED, of Sheffield, have appointed C. A. Hunton & Sons, London, agents for their "Pax" brand tungsten hack saw blades.

*Abstract of Scientific Paper No. 426. U.S. Bureau of Standards.

Patternshop Bandsaws.

BY J. DRINKWATER.

The bandsaw is the most useful tool in the patternshop, but its degree of usefulness depends entirely on the condition in which it is kept. In some patternshops it is anybody's business to look after the machines, and consequently bandsaws are continually breaking owing to bad alignment, "crowding" (which is the term for pressure on the back of the saw), bad brazing or wrong tension. It has become the practice in many patternshops to employ a wood machinist to tend the machines, but inasmuch as the average machinist has been trained to one type of machine and finds it difficult to adapt himself to patternshop conditions, the trained patternmaker with a taste for machine work is a more valuable man. Unfortunately, there are very few patternmakers at the present day who can even sharpen a bandsaw, although it is not always their fault. It is a fact that even in large shops when the machinist goes off the bandsaw is not of much value until he returns.

A narrow saw makes a finer cut, but for deep, straight cuts a wide saw ought to be used; indeed, there should be no hesitation about changing a saw to suit particular jobs. It is manifestly absurd, for instance, to try to negotiate small diameters with a wide saw, yet it is frequently done. Some men persist in forcing a saw, and thus they do not get a square cut. No greater strain can be imposed on a bandsaw than for the work to be continually eased back and then jerked forward. It is not wise to run the saw slack, but it is equally foolish when making a deep cut to increase the tension in the belief that by doing so a straight cut will be ensured.

A portable bandsaw of moderate capacity has been put on the market recently by an American firm, but perhaps the most satisfactory gauge of saws for wheels 36 in. dia., No. 21 gauge, and 30 in. dia. 22 gauge. Each saw will cope with nearly all jobs in patternshops. In large shops two saws may be installed with advantage, one being fitted with a narrow saw and the other with a wide one. It is for the man in charge to see that suitable work is done at each saw. Careless, slipshod methods are responsible for most of the breakages that occur, at any rate if brazing has been properly done. It places an unjustifiable strain on the machine, for instance, to make an angle-cut with an edge bearing on the table. A simple jig can invariably be made when the work cannot rest solidly on the table. In this connection it may be pointed out that a little ingenuity in devising jigs extends the usefulness of the saw considerably. It is sometimes possible to make a box with square faces, inside of which the job can be screwed. A spherical piece of wood enables radial cuts to be accurately made. When sawing large diameters (it is quite common in some shops to saw work 12 ft. or more in diameter that has been segmentally built) trestles should be used that are the same height as the machine table. If the tops of the trestles are in the form of a roller not only is the work of sawing less laborious, but less strain is placed on the saw. It is well-nigh impossible for several men to hold a large heavy job level on a small table.

Fractures at the back of a saw are frequently caused by the bad setting of the guides carried on the adjustable arm, or rather the disc which takes the backward thrust, and sometimes tooth or gullet fractures result from filing too sharp a tooth angle. The gullets should be kept round by filing with a file with rounded edges.

It is surprising how few even good machinemen can properly braze a bandsaw. Correct sharpening can be quickly learned, but with brazing it is difficult. It is not so much skill as care that is required. A well-brazed saw should be equally strong throughout the entire length. With proper care breakages should be few. It is very bad policy to work a saw after it has become blunt, as the forcing which is necessary will inevitably cause strain. A sharp saw will almost finish the work, whereas to make sure that a blunt saw does not undercut, it is necessary to saw it to cut wide of the line, and much chiselling and gouging is afterwards necessary.

Institution of British Foundrymen.

BURNLEY BRANCH.

At the first Annual Meeting, Mr. J. Hogg presiding, the report was read by the Secretary, Mr. Pell, who congratulated the members on the results of the first session's working. The membership was 45, made up of 21 members and 24 associate members.

The Chairman said a good deal of interest had been shown in the meetings of the Branch, and the future prospects were satisfactory. Some applications for membership had already been promised.

The election of officers and council for the next year resulted as follows:—President, Mr. J. Hogg; Senior Vice-President, Mr. R. H. Place; Junior Vice-President, Mr. W. Hartley; Secretary, Mr. J. Pell; Representative on General Council, Mr. Hartley; Branch Council for three years, Messrs. McLaren, Fawcett and Jackson; for two years, Messrs. Vernon, Beecroft and Hilton; for one year, Messrs. Castree, Waring and Jackson.

Burning-On.

MR. A. SUTCLIFFE, of Bolton, gave an address upon Burnt Castings, which was of a very practical nature, being devoted mainly to a description of various jobs which had been successfully dealt with. He said the subject was rarely discussed, for what reason he did not know, because there was no question that a bay casting could sometimes be made satisfactory by burning and therefore in its proper place it was good. This applied to every part of the engineering trade. By burning-on by the foundry many mistakes and difficulties were got over for draughtsmen and for workers in the pattern, fitting and turning shops as well as for the moulder. It was a help to everybody concerned. It was used to cure defects in castings, to repair broken ones and to join separate pieces together. The method was to flow molten metal over the parts to be united. This was done by moulding channels over the junctions where the metal was poured with outlets for the surplus metal to flow into a rut or pig mould. The mould for a burn might be either open or boxed and covered with a top part, according to whether the upper surface was horizontal or otherwise. Surfaces of the burning parts should be perfectly clean, as this would make a difference to the amount of metal required to burn the casting. A box burn was the same as an open one except that the channel or part mould was covered over with a top part, and a runner and flow-off provided. In every case the latter came off at a higher level than the casting and at a lower level than the runner. Examples given were a mortar mill roller in which the core had lifted at one side, and a piston block where one core of the six cores had lifted through the top. These cores were rubbed at the parts coming to the top of the casting and the thin edges of metal broken off till it came to the casting thickness. Then a top was put on and the molten metal poured through. In preparing such burns the inside of the casting might be rammed with sand or daubed with loam. Sometimes it was dried in the stove. The casting could then be set in a pit or on a foundry floor, in the position required, and the necessary channels made up in sand or loam, the latter being in the form of loam cakes carved down to shape, or it could be daubed with wet loam. Molten metal was then run against the casting, a drop at a time, from a hand ladle. The hotter one could get a casting before burning the better, as it took less metal to burn the job. He did not advocate burning fires on the top of the job. He had in mind one job—a cylinder body with a hole on the outside—in which this was tried for above two hours unsuccessfully. He then took it in hand himself. He put a little wet loam round the hole ¼ in. above the casting and a small well round; this was filled with metal and when hot enough it was burned. It was a good job. Half an hour was quite sufficient for it, if a longer time was taken the heat went up and the fires went dead at the bottom. This was the case with every kind of fire. Success in burning any part of a casting which had no freedom of movement depended upon having the whole of the casting as fully expanded as possible before treatment, in order to eliminate as far as possible the risk of cracking due to unequal expansion and contraction. In the case of cast iron, burning a hot casting with the resulting slow cooling had the further advantage of eliminating chill in the burned parts.

If the defective part of a casting was large, it was better to cast separately a piece of the required shape, loosely fit it into the aperture, and then follow the joint by a series of open burns. Apart from the difficulty of contraction cracks, burning either cast iron or brass castings was effected with comparative ease and the process had a legitimate position in any foundry. As a means of removing unsightly, but otherwise unimportant, defects, of repairing broken castings, or joining separate castings together, it had a very useful purpose. From experience he could say that comparatively few founders carried burning beyond its legitimate sphere. One job he dealt with was a tank plate about 4 ft. sq., and the part operated upon was about 2 ft. 6 in. in length from point to point. Mr. Sutcliffe gave details of it, explaining upon a diagram. Mr. Pell remarked that with a job of that kind it might be better to make a new plate rather than adopt burning. Mr. Sutcliffe agreed that that course might sometimes be preferable, but pointed out that unless faults were cured scrap iron accumulated. In his opinion it was better to put oneself to a little trouble in order to get the job out of the way. In THE FOUNDRY TRADE JOURNAL for March 30 (page 228) an account was given of the repairing of the cast-iron frame of a punching and shearing machine from which the table had been completely broken off. The job was said to have taken 60 hours. He had often done a similar job by burning in three hours.

A vote of thanks to Mr. Sutcliffe was passed.

Correspondence.

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

The Birmingham Conference.

To the Editor of THE FOUNDRY TRADE JOURNAL.

SIR,—Owing to the lateness in sending in their applications, I regret to say that many members will be disappointed in not being able to attend the various functions at the forthcoming Conference. There has been no option but to refuse these late applications, otherwise the comfort of members and the smooth working of the very large organisation I have had to set up would have been seriously jeopardised. I trust, therefore, these late members will bear in mind that for the first time we have endeavoured to bring the standard of our Conference up to that attained by the older Institutions, hence the necessity of a definite closing date.

It is not necessary for any member attending the Conference Sessions to obtain a ticket; his membership entitles him to do so without any further application. This I hope is clearly understood. He is only prevented attending the works visits or other functions if he has not previously obtained a ticket.

Any member can also apply at the Conference office for his badge, as every member attending the Conference is entitled to wear it. I shall be very pleased to supply same to any member upon personal application in the Conference week.—Yours, etc.,

THOS. VICKERS.
Conference Secretary.

June 3, 1922.

SIR WILLIAM NOBLE, who has just retired from the position of engineer-in-chief to the Post Office, has accepted a seat on the board of the General Electric Company, Limited. Sir William Noble proposes to devote his attention mainly to the development of the telephone and wireless sections of this concern.

MR. W. BLAKE BURDEKIN has died at Silver Howe, Sidmouth, where he had been residing for some years. In his 65th year. Mr. Blake Burdekin was a son of Mr. Joseph Burdekin, of The Uplands, Sheffield, and Scarborough. In 1878 Mr. Blake Burdekin joined the staff of William Jessop & Sons, Limited, Brightside, of which firm his father was a director, and subsequently, on the retirement of Mr. Alfred Hills, he was appointed secretary and afterwards director of the company. He retired some years ago.

XUM

Trade Talk.

THE imports of foreign ore at the Seaham Dock at Maryport last week amounted to 7,000 tons.

JOSEPH KAYE & SONS, LIMITED, Lock Works, Leeds, have received an order from the Admiralty for 1,728, of their patent seamless, serrated oilcans.

THE HOFFMAN MANUFACTURING COMPANY, LIMITED, have removed their London office from 59, New Oxford Street, to 8, Bedford Square, W.C.1.

THE ST. GEORGE'S ENGINEERING COMPANY, of 8, St. George's Terrace, Brearley Street, have removed to Britannia Works, Hospital Street, Birmingham.

CALLENDER'S CABLE & CONSTRUCTION COMPANY, LIMITED, have removed their chief office in Scotland from Stirling to 23, Melville Street, Edinburgh.

E. A. INGOLD, LIMITED, Otley Road, Shipley, have been appointed agents in Yorkshire for Mawdsley's, Limited, manufacturing electrical engineers, of Dursley.

WARD & GOLDSTONE, LIMITED, electric equipment manufacturers, of Manchester, have opened additional premises at 8a and 9, Great Chapel Street, Oxford Street, London, W.1.

W. T. GLOVER & COMPANY, LIMITED, Trafford Park, Manchester, have appointed the Mining and General Stores, Limited, of 24, Baxter Gate, Doncaster, as their agents in the Midlands.

THE UNITED STATES INTERSTATE COMMERCE COMMISSION have reduced railway freight rates throughout the country 10 per cent. from the levels established by the rate advance of July, 1920.

W. H. ALLEN, SON & COMPANY, LIMITED, the Bedford firm of mechanical and electrical engineers, have removed their London office from Queen Anne's Chambers to 5, Victoria Street, S.W.1.

THE UNITY ENGINEERING AND CHEMICAL COMPANY, 94, Market Street, Manchester, have been appointed agents in that town for T. H. & J. Daniels, Limited, of Stroud, gas engineers, brass and ironfounders.

THE council of the Scottish Branch of the Ceramic Society has decided that the members should meet periodically to read and discuss practical papers in connection with the manufacture and use of refractory materials.

MR. ERIC TOFT has retired from the firm of Radford & Toft, electrical engineers, of Altrincham, Cheshire, and the business will in future be carried on by Mr. Luke Radford under the style of L. Radford & Company.

G. S. PECKHAM & COMPANY, of New Compton Street, Charing Cross Road, London, W.C.2, have been appointed sole agents for London and the South of England for the Patent Flexible Belting Company, Eldwick, Bingley, Yorks.

THE AUSTRALIAN MINISTER FOR TRADE AND CUSTOMS has decided that drawback of duty paid may be allowed, subject to the usual conditions, on imported mild steel billets used in the manufacture of machinery in Australia when exported.

THE NEWCASTLE AND DISTRICT BRANCH of the Institution of British Foundrymen held their final meeting of the session in the Mining Institute on Saturday last, when Mr. J. H. Watson, of Blaydon, read an interesting paper on "Foundry Sands."

T. G. GRAY & COMPANY, LIMITED, 119, High Holborn, W.C., inform us that a fire occurred at their Midland Works in the early hours of Saturday, May 27. Fortunately the damage was only slight, and the output of the factory has not been affected.

THE first cargo of North Lincolnshire tinplate bars for South Wales was loaded at Immingham Dock, on May 22, when the s.s. "Deerwood" took in 2,680 tons of this traffic in nineteen working hours. Being at the rate of 141 tons per hour, this is very good despatch for the class of traffic.

MESSRS. R. J. POUPARD and C. S. CADEL, who have been associated for many years with Charles Yates & Company, iron and metal merchants, Billiter House, London, E.C., have established themselves in a similar business at 39, Victoria Street, Westminster, London, S.W.1, under the style of Poupard & Cadel.

INTIMATION has been made to Messrs. J. C. Bishop and O. Coyle, joint secretaries of the Scottish Manufactured Iron Trade Conciliation and Arbitration Board, to the effect that the chartered accountant has examined the employers' books for March and April, 1922, and certifies the average net selling price brought out as £11 13s. 3.68d. This means a decrease in the wages of the workmen of 10 per cent. on basis rates.

THE BRITISH NON-FERROUS METALS RESEARCH ASSOCIATION has just issued, in its quarterly bulletin, a Union list of periodicals of interest for reference on industrial metallurgy. The service provided by 14 libraries in London, Birmingham and Manchester is clearly indicated, so far as concerns the 118 periodicals which have been selected, and the next edition will include additional libraries and periodicals which experience with the present list suggests as desirable.

IN connection with the forthcoming Centennial Exhibition, a Hydro-electrical Congress will be held at Rio de Janeiro. The Congress will discuss all questions pertaining to water-power developments which are about to engage the attention of the Federal Government, and also of several of the Provincial Governments, notably Minas Geraes and Sao Paulo. It is expected that a large number of contracts for the utilisation of water-power will result from the deliberations of the Congress.

THE directors of Platt Brothers & Company, Limited, Oldham, have issued a circular stating that an offer has been received for the purchase of all the ordinary shares at 45s. per share. The vendors are also to receive a dividend of 20 per cent. in respect of the past year. The preference shares and debentures will not be affected. After the sale, the purchasers will capitalise some of the accumulated undistributed profit of the company by an issue of preference shares, such shares to be allotted to the holders of ordinary shares in proportion to their holdings. The consent of 75 per cent. of the holders of ordinary shares is stipulated.

CLYDE shipbuilding returns show a recovery, the output for May consisting of 14 vessels of 26,500 tons. This compares with 19 vessels of 22,752 tons in May, 1921. From the middle of March to the middle of May there were practically no launches on the river, and it looked as if only a small tonnage would be put into the water in the remaining two weeks of this month. There were, however, three fairly large vessels near the launching stage, and also two smaller cargo steamers, and a Mersey ferry, as well as eight launches of sailing yachts, so that the total, though well below the average for the month, was considerably above the minimum. Practically no new contracts for the Clyde have been reported for a long time, and the only order booked this month is one for a self-trimming collier, to be built by the Burntisland Shipbuilding Company. For the five months now closing, the Clyde output totals 46 vessels, of 132,587 tons, as compared with 102 vessels, of 195,429 tons, in the corresponding period of last year, and 105 vessels, of 293,997 tons, in the first five months of 1913, which was the record for the period.

Company News.

R. Hurner, Limited.—Capital £6,000 in £1 shares. Machinery manufacturers.

Dickson & Mann, Limited.—Total deficit, £9,000, transferred from reserve.

John Shaw & Sons, Limited.—Ordinary dividend, 5 per cent., less tax, for year.

Brunner, Mond & Company, Limited.—Final ordinary dividend, 5½ per cent., making 8 per cent. for year.

North Lonsdale Iron & Steel Company, Limited.—Interim dividend for half-year to April 30 last passed.

Stanton Ironworks Company, Limited.—Final dividend, 6 per cent., free of tax, making 10 per cent. for year.

Cleveland Bridge & Engineering Company, Limited.—Interim ordinary dividend, 5 per cent. per annum, tax free.

Alley & Maclellan, Limited.—Dividend for year, 6 per cent., less tax; depreciation, £26,227; carried forward, £5,564.

Hutchison's Turbinia Oil Burners, Limited.—Capital £5,000 in £1 shares. Registered office: 30, George Square, Glasgow.

Hydrotherm, Limited.—Capital £1,500. Ironfounders and engineers. Registered office: Kingsway House, Kingsway, W.C.

Naylor Benzon Engineering, Limited. — Capital £20,000. Directors: C. S. Ascherson, A. D. Tisdall, and A. C. Hay.

London Tool & Gauge Company, Limited. — Capital £100. Permanent governing directors: C. W. Taylor and A. R. Kearney.

Chloride Electrical Storage Company, Limited.—Final dividend, 5 per cent. actual, free of tax, making 10 per cent., free of tax, for year.

Jenkins, Hitt, & Grant, Limited.—Capital £6,000 in £1 shares. Engineers. Registered office: 51, St. Thomas Street, Weymouth, Dorset.

Hamilton & Company, Limited. — Capital £2,000. Engineers, etc. Director: A. G. Hamilton. Registered office: 135, Buchanan Street, Glasgow.

Green Hull Construction Syndicate, Limited. — Capital £5,000 in 5,000 participating preference shares of £1 and 5,000 ordinary shares of 2s. each. Mechanical engineers.

J. Stone & Company, Limited.—Profit, £176,152; brought forward, £52,633; available, £228,785; reserve, £25,000; ordinary dividend, 7½ per cent. for year; carried forward, £128,755.

Carolina Engineering & Motor Panel Company, Limited.—Capital £3,000. Permanent directors: J. A. Anderson, J. W. Anderson, and A. Grieves. Registered office: 59a, Strand Road, Bootle, Liverpool.

IRON AND STEEL MARKETS.

Pig-iron.

The commencement of the holiday season has made little appreciable difference in the conditions of markets as far as pig-iron is concerned, as the home demand for foundry and forge qualities could scarcely become more depressed than it has been. Foundrymen everywhere are exceedingly short of orders, and with the almost general suspension of the engineering and shipbuilding trades the outlets for furnace outputs are necessarily restricted. In the Midlands, especially, pig-iron is accumulating in makers' yards, this centre being at a disadvantage in competing with coastwise producers for export shipments, while the demand for pig for manufacturing purposes is now extremely limited. A rather more cheerful note is struck in reports from Clydeside, there having been a stronger tone in the Scottish pig-iron market last week than has been experienced for many months. Makers are all very firm in their prices, and not by any means eager sellers. Quotations for foundry iron have been advanced all round by 1s. 6d. to 2s. 6d. per ton, the first advance that has taken place since prices started to recede from the peak figure of £13 5s. ruling in September, 1920, compared with 95s. now quoted. On Tees-side there has been a further curtailment of business in view of the holidays, while the foreign demand has also slackened off, as regards Continental shipments of Cleveland iron. Some inquiries on American account are, however, in circulation on this side, a cargo of Scotch pig-iron having been sold for shipment across the Atlantic, and another cargo is to go from Immingham, whilst inquiries are also reported locally for foundry iron and ferro-manganese. But the market must continue lifeless till the engineers get back to work, and until after Whitsuntide output is certain to outstrip consumption, the balance, of course, having to go into stock. With the exception of No. 1 quality all classes of Cleveland iron are now plentiful, and no difficulty is experienced in meeting prompt orders. Prices, however, are firm, f.o.t. or f.o.b. quotations being:—No. 1 Cleveland and silicious, 95s.; No. 3 G.M.B., 90s.; No. 4 foundry, 87s. 6d.; No. 4 forge, 85s.; mottled and white, 80s.

The market for East Coast hematite has taken a distinctly slower turn of late, and rumours are current that some furnaces are to be damped down in preference to accumulating stocks. Consequently the market generally is quiet, but makers adhere to 95s. for East Coast mixed numbers, with 1s. per ton premium for the No. 1 quality. Gjers, Mills & Company have put out one furnace, two are out at Thornaby, and Seaton Carew are stopping one.

Finished Iron.

The depression recently noted in the markets for finished iron remains unrelieved, with faint prospects of alleviation until the outlook in labour difficulties becomes much improved. The majority of the South Staffordshire works will on this occasion considerably extend the usual holiday period, very few resuming operations for a full week to come, or even longer, much, of course, depending upon whether the A.E.U., boilermakers and foundry workers return. Meant'me, the irregularity in prices is most marked, for while some crown bars are obtainable at £11, other makers will not consider any offer of less than £11 15s. It is very seldom that there is such a range of prices for what should be more or less a standard product; at any rate, as near standardised as the trade can produce. There is a little more business in commoner makes, but prices, though not lower, are very poor. Iron strip is in extremely small sale. The Wages Board ascertainment for South Staffordshire ironworkers, now due, is expected to show a further fall in the selling price and to carry wages down with it.

Steel.

There has been little improvement in the current stagnant conditions in the steel trade, and with many of the principal works already closed down, the Whitsuntide holiday period had scarcely any effect upon operations in any of the branches still in partial employment. There is, however, a disposition in steel trade circles to take a more sanguine view of the outlook, a confident opinion being expressed that a final settlement with the A.E.U. boilermakers, etc., will shortly be achieved, followed by a period of brisker inquiries, and the placing of substantial orders for material urgently required for reconstruction purposes. In the Sheffield steel market there is a better inquiry for basic billets, but the quietude in acid qualities continues. For soft, medium and hard basic the quotations are respectively £7 15s., £8 15s., and £9 5s. delivered, while Siemens acid are £10 and Bessemer acid £12. There has been some active buying of basic steel recently, particularly for abroad, though some fairly substantial inquiries on home account have also been made. Bright steel strip is more freely inquired for. The production of steel generally is at present very small, the crucible steel section doing very poorly.

Scrap.

Business in all descriptions of scrap metals continues quiet, markets, with few exceptions, reporting nothing doing, but in the event of a satisfactory settlement of outstanding labour troubles, no doubt is entertained in the trade that an immediate revival of demand would follow. At Middlesbrough buying is practically restricted to small quantities of steel scrap. The following are approximate prices:—Heavy steel scrap, 61s. to 62s.; steel turnings, 45s.; cast-iron borings, 45s.; heavy wrought-iron piling scrap (nominal), 62s. 6d.; ditto, bushelling, 62s. 6d.; ditto, special heavy forge, 67s. 6d. to 70s.; heavy cast-iron machinery scrap in handy pieces, 80s.; ditto, ordinary qualities, 75s All delivered works.

Tinplates.

Buying in the tinplate market of late has been on a more active scale, mostly for spot lots, but, so far, there has been little improvement in demand for plates to order, which makers would welcome to keep plants going regularly. Last week there was a sharp advance in I C 14 by 20 Cokes from about 19s. to 19s. 6d. per ton, for coke finish, net cash, f.o.b. Wales, and 28 by 20 in 112 sheets from 38s. 3d. to 39s. per box, a fair amount of buying for May-June taking place; 19s. 6d. basis is generally quoted for July-August, but not much business has so far resulted. There is only a fair inquiry for coke wasters, for which quotations rule firm at about previous figures.

Metals.

Copper.—The trend of markets generally has indicated a firm and steady tendency, but in the case of standard copper buying has been on a modified scale, due to holiday influences, although all round values show some fractional improvement day-by-day. The business transacted has been perhaps more active on forward account, dealings in prompt metal having been restricted in volume as customarily experienced at this season. The position in the United States continues strong, with further advances in refined qualities. Electrolytic here has also been advanced to £69 10s., with wire bars at £71. Closing prices.—*Cash*: Wednesday, £62 15s.; Thursday, £63 2s. 6d.; Friday, £63 8s. 9d.; Monday, closed; Tuesday, £63 2s. 6d. *Three months*: Wednesday, £63 2s. 6d.; Thursday, £63 10s.; Friday, £63 16s. 3d.; Monday, closed; Tuesday, £63 10s.

Tin.—A somewhat more hopeful view of the industrial outlook has had an encouraging effect upon the market for standard tin, with the result that values have shown a consistent firmness. There has also been a slight improvement in consumers' demands, but anticipations of an unfavourable statistical return for the month just ended has considerably retarded buying for early deliveries. Market movements at the week end were without special importance, America only buying sparingly, while Continental inquiries and Welsh demands were limited in volume. English ingots remain firm at £155. Closing prices.—*Cash*: Wednesday, £152 7s. 6d.; Thursday, £153 5s.; Friday, £154; Monday, closed; Tuesday, £154 15s. *Three months*: Wednesday, £153 15s.; Thursday, £154 10s.; Friday, £155 5s.; Monday, closed; Tuesday, £155 17s. 6d.

Spelter.—The improvement previously reported in the market for this metal is well maintained, and a substantial turnover has been recorded. Buying on Continental account has been fairly good, and values show a steady tendency. Closing prices.—*Ordinary brands*: Wednesday, £28 5s.; Thursday, £28; Friday, £28 5s.; Monday, closed; Tuesday, £28 2s. 6d.

Lead.—The market for soft foreign prompt maintains its firmness, but prices have not shown movement. Dealings have been on a fairly heavy scale, with June deliveries done £24 15s. to £24 17s. 6d. English lead continues steady. *English closing prices*: Wednesday, £26 5s.; Thursday, £26; Friday, £26; Monday, closed; Tuesday, £26.

Deaths.

Mr. W. B. Lloyd, of Lloyd & Son, Limited, iron merchants, of 105, Wellington Street, Woolwich, died recently.

Mr. George Wordsworth, of George Wordsworth & Sons, Limited, wire manufacturers, of Thurgoland, near Sheffield, died recently.

Mr. W. J. Read, managing director of James Mills, Limited (Exors. of), Bredbury Steelworks and Rolling Mills, Stockport, died recently.

Mr. Henry Withy, who until 1908 was a director in the well-known firm of Furness, Withy & Company, Limited, has died suddenly at West Hartlepool. He was seventy years of age.

Mr. Lewis H. Ransome, director and chairman of A. Ransome & Company, Limited, and the Ransome & Marles Bearing Company, Limited, of Newark, died in London on Wednesday, May 24, after a prolonged illness.

Mr. Albert James Moore died at his residence, Brookland, Langloan, Coatbridge, on May 16, after a short illness. Mr. Moore acted as managing director of the Langloan Iron and Chemical Company, Limited, and was a member of the Scottish Ironmasters' Association.

Mr. H. Greenleaves, joint managing director of the United Brassfounders and Engineers (1920), Limited, of Empress Street, Manchester, died on May 18, aged 59. The deceased gentleman was associated for many years with Isaac Storey & Sons, Limited, who were ultimately absorbed in the United Brassfounders and Engineers.

Mr. G. Whitfield, of "Longfield," Dunston, head of the firm of Messrs. McFarlane & Whitfield, rivet manufacturers, Dunston, has died at the age of 78. A native of Openshaw, the deceased went to Newcastle over 50 years ago to take up the position of foreman with Messrs. R. & W. Hawthorn, locomotive builders, Newcastle. Ten years later, along with the late Mr. Alex. McFarlane, he established the Atlas Rivet Works at Dunston.

Mr. R. Lowndes, secretary of the Midland Iron and Steel Wages Board, announces that the wages regulated by the sliding scale under the Midland Iron and Steel Wages Board, will be reduced 12½ per cent. from Monday, June 5, to Saturday, August 5.

Personal.

The late Mr. A. S. Rae, iron merchant, of George Stephen & Son, of Castle Street, Dundee, left £21,607.

Mr. J. S. Yates, of Yates & Company, Limited, electrical engineers, Pretoria, is in England on a business visit.

The late Mr. W. Lupton, J.P., a director of Lupton Brothers, Limited, Grange Ironworks, Accrington, left £12,911.

Mr. R. J. Wilmot has resigned his position of secretary to the A. & A. Electrical Company, Limited, in order to take up a similar appointment with the L.F.A., Limited.

The late Sir William Lorimer, Kt., chairman of the North British Locomotive Company, Limited, and until last year chairman of the Steel Company of Scotland, Limited, left £470,170.

Mr. Wm. Hildrey, late assistant manager of the Government Instructional Factory, Birtley, has been appointed manager for the northern area of England to Alfred Herbert, Limited, Coventry.

Mr. H. C. Tofield, managing director of Tofield & Robinson, Limited, electrical engineers, of Birmingham, has resigned his connection with that firm, and established himself in business at Temple Passage, Temple Street, Birmingham.

The Cleveland Delegate Board of the National Union of Blastfurnacemen, at a conference held at Middlesbrough, considered the employers' claim for a reduction of wages, and after going into the question very thoroughly, it was decided to refer the matter to the lodges.

Gazette.

The Alfo Electrical Engineering Company, Limited, are being wound up voluntarily, with Mr. J. R. Dickin, 37, Moorfields, Liverpool, as liquidator.

Messrs. F. H. Davies and E. G. Rowe, trading under the style of Davies & Rowe, 119, Dunraven Street, Tonypandy, electrical contractors, have dissolved partnership.

The partnership heretofore subsisting between Messrs. A. Keating and C. R. Adams, metal merchants and brokers, 27, Gorton Street, Rochdale Road, Manchester, trading under the style of Arthur Keating, has been dissolved.

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